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The Aeronautical Journal.

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NOTICES OF The Aeronautical Society.

A meeting of the Council was held on July 17th, at the Society of Arts, when the following gentlemen were elected Members of the Society :—

MR. CHARLES GROOMBRIDGE.

MONSIEUR EUGEN SVERTCHKOFF.

Read letter, dated June 17th, from Mafeking, from Major B. F. S. Baden-Powell resigning the post of Honorary Secretary of the Aeronautical Society.

RESOLVED—

The Council, whilst accepting with regret the resignation, take this opportunity of recording the very valuable services rendered by him to the Society, which he virtually re-established from the time he accepted the Honorary Secretaryship, and especially by his inaugurating the new quarterly "Aeronautical Journal."

Proposed by MR. E. P. FROST,

Seconded by MR. HIRAM MAXIM,

That Major Baden-Powell be elected as President of the Aeronautical Society of Great Britain.

Carried unanimously.

Proposed—That Mr. Eric Stuart Bruce be invited to accept the post of Honorary Secretary of the Aeronautical Society of Great Britain, in place of Major B. F. S. Baden-Powell resigned.

Carried unanimously.

ERIC STUART BRUCE,
Honorary Secretary.

It is found necessary to call the attention of members and others to Rule 45, which states that "Every paper which may be presented to the Society shall, in consequence of such presentation, be considered as the property of the Society, unless there shall have been any previous engagement with its author to the contrary; and the Council may publish the same in any way, and at any time, they may think proper. But should the Council refuse or neglect, within a year, to publish such paper, the author shall have a right to copy the same, and publish it under his own directions. No other person, however, shall publish any paper belonging to the Society without the previous consent of the Council."

As it will be noticed that the words "All rights reserved" appear for the first time on the current number of the "Aeronautical Journal," the Editor wishes to explain that this notice is not intended to divert criticism of its contents or legitimate quotations from its columns, but merely to maintain Rule 45 quoted above, valuable papers, which are the property of the Aeronautical Society, having recently been copied in their entirety from the Journal without the consent of the Council.

The Resignation of Major Baden-Powell from the Honorary Secretaryship of the Aeronautical Society.

As will be seen by the published Minutes of the Council Meeting of the Aeronautical Society of July 17th, Major Baden-Powell has resigned the Honorary Secretaryship of the Society. This news will be received with regret not only by the members of the Society, but by all those in this country or abroad, who have had the privilege of intercourse and correspondence with him, and who have appreciated his ever readiness to give information or advice on those aerial subjects to which he has devoted so much of his energies. But the term of his Secretaryship has been sufficiently long to place the Aeronautical Society of Great Britain on a secure and lasting basis, and the Presidency of the Society, which has been accorded him, is an honour that is well won.

The scientific world lately received with the most intense satisfaction the news that Sir William Crookes, that most illustrious Member of the Council of the Aeronautical Society, had accepted the Honorary Secretaryship of the Royal Institution. It is needless to state how brilliant, profuse, and far-reaching have been the discoveries of this profound searcher after truth. Many of them are reflected in the applications of science to the wants of daily life, such as the familiar incandescent lamp made possible by the professor's researches in high vacuas, while "the Crookes Tube," as the vital necessity of the Rontgen radiation, has added well-nigh infinite resources to the practice of modern surgery. As was stated by a high scientific authority on the occasion of the jubilee of the Royal Institution, there is probably no institution in the world that has extended science so much as has the Royal Institution, and it rests indeed on solid foundations of prestige. But the happy choice of its present Honorary Secretary is destined to add a new lustre to its proceedings, and enhance its world-wide fame.

Major Baden-Powell has been appointed by General Paget, Railway Staff Officer at Warm baths, Transvaal.

Mr. Eric Stuart Bruce, the Honorary Secretary of the Aeronautical Society of Great Britain, has been elected Membre d'Honneur of the Paris Aero-Club.

The Aeronautical Society of Great Britain.

An ordinary meeting of the Aeronautical Society was held at the Society of Arts, John Street, Adelphi, on Tuesday, July 17th, 1900. Major H. C. Roberts occupied the chair.

The CHAIRMAN: Ladies and Gentlemen,—I have to inform you that the reason of the delay in calling this meeting was partly on account of the absence of our Honorary Secretary, Major Baden-Powell, whom we had hoped at one time would have been able to be present at this meeting. We must, however, look forward to seeing him at a future time. There was also another reason for the delay, because our Honorary Secretary, Mr. Eric Bruce, has been over in Paris addressing the meeting of the Aeronautical Society there. He has been there for many weeks, and has written out for our satisfaction a brief essay of what he read there. I shall not detain you any further, because we have a long meeting before us, and I will now ask Mr. Bruce to say a few words.

MR. ERIC STUART BRUCE: I have to announce to the meeting of this Society to-night, news that I have just received from Major Baden-Powell, dated June 17th, Mafeking. In the letter which he has addressed to me he says that he wishes to send in his resignation as the Honorary Secretary of this Society. I feel sure that all the members of the Society receive this news with very great regret. I do not think that any Secretary of any Society has ever done so much in so short a time as Major Baden-Powell has done for the Aeronautical Society of Great Britain. It is not exaggerating the truth when I say that the Aeronautical Society of Great Britain holds as important a position in the scientific world as any scientific society in this metropolis. Therefore, I think we shall all regret his absence as Honorary Secretary, and I am afraid it will be a secretaryship that will never be replaced.

The CHAIRMAN: I beg to announce, ladies and gentlemen, that since we received this letter from Major Baden-Powell resigning the post of Honorary Secretary, we have in Council Meeting passed unanimously a proposition that he be elected as President of the Society. This, I think, will be very gratifying to all of us, especially when we know the trouble he has taken in carrying on the affairs of the Society for so long a time. We have next to call upon Mr. Hiram Maxim, who will read a paper on the subject of the Balloon Experiments carried out by Count Zeppelin in the airship of which we have seen some account in the papers.

THE ZEPPELIN AIRSHIP.

By HIRAM STEVENS MAXIM.

I have been asked to give my opinion in regard to the value of the experiments of Count Zeppelin. I have made a close study of balloons for many years, and have followed very closely the experiments of Gaston Tissandier and Commandant Renard. In the experiments of Gaston Tissandier, the balloon was made cigar-shape, both ends being practically alike. The propelling force was a screw driven by an electrical engine. The machine was very carefully made, and was probably as beautiful a piece of workmanship as ever has been turned out. It was inflated with pure hydrogen. When it was tried, it rose in the air to perfection, and moved at a low velocity by means of its own screw and motive power, but the velocity through the air was considerably less than the velocity of the air itself, consequently it moved along with the wind very much like any other balloon. Other experiments were made, and it was found that the cigar-shape was not so favourable as a fish-shape balloon. Captain Renard constructed several balloons, the greater part of which were fish-shape, that is, full forward, and slim

and tapering aft. In these balloons, the very best accumulators and electrical engines were employed for propelling a screw of large diameter that was used. On one occasion in a dead calm, the balloon ascended, travelled some three or four miles, and returned to the point of departure. It was drawn down by ropes and put back into the shed, where it had been built, and this is, I believe, the only instance in the history of the world where a balloon has returned to the point of departure.

Many other experiments have been made by Captain Renard, who is, as is well known, employed by the French Government, and who has unlimited means and assistance at his disposal.

But in no case, except in the one just mentioned, has he succeeded in making his balloons return to the point of departure. It was told me by one of his assistants that the balloons only travelled about four miles an hour, and as the wind always blows a little more than four miles an hour, they were sure to travel with the wind exactly as all other balloons had done before.

In regard to the recent experiments of Count Zeppelin, it appears that a very large and expensive balloon was constructed. To prevent all the gas from getting into one end of its elongated form, as often happens, a considerable number of compartments were employed, each of which was filled with hydrogen gas. Instead of using an electrical engine, as had been employed in France, he used a much stronger and lighter motor, viz., a petroleum engine. The French, whilst acknowledging that a petroleum engine developed more power for its weight than could be done by electricity, appeared to be afraid to employ it on account of the great liability of igniting the gas in the balloon.

In the first accounts of these German experiments, it was said that the balloon travelled 30 miles. We then hear that it travelled about three miles, and was finally towed back to the shed where it had been built. As all the information I have at hand is based on newspaper reports, and no two of these are alike, I do not feel that I have sufficient reliable data by me to draw any conclusions. I would, however, say that it appears to me quite useless to endeavour to make a balloon that would travel against the wind. A balloon, in the very nature of things, has to be lighter than the same volume of air. Its density is therefore very small. In order to be of sufficient size to lift itself, and any considerable load, it necessarily has to be of great dimensions, and being of great dimensions, and, as one might say, very soft and fragile, it cannot be made to travel against the wind. As before stated, balloons always have travelled with the wind, and it appears that this new German balloon is no exception to the rule. The experiments of Professor Langley, Mr. Horatio Phillips, and myself have been sufficiently successful to demonstrate that not only great lifting effect but also propelling effect may be obtained by the use of aeroplanes and screws, that is, with true flying machines—machines heavier than the air. But these experiments are extremely expensive, and require a great deal of time. Flying machines are sure to come in the immediate future. We certainly have enough skill in England to build one. I think the same may be said of the United States of America. In France, however, although they may have no more skill than we have, the abundance of money which they have at their disposal gives them a great advantage.

In regard to the use of flying machines, there can be no question but what at first they will be rather risky things to play with. Their primary use will be for warfare. I think I may say that the danger of navigating such a machine and of reconnoitring an enemy's position will not be greater than any other form of reconnoitring—in fact, I should say it would be infinitely less. I think flying machines would also be of great value for conveying despatches over difficult country in time of war, to say nothing of occasionally dropping a bomb into the place where it would do the most good.

Flying machines, like automatic guns, make war more difficult and expensive. They will give to the highly civilised nation, which has both money and engineering skill, great advantages over poorer and less skilful nations, which will, of course, be a potent factor in extending the borders of civilisation, or, as one might almost say, of civilising the world.

The CHAIRMAN: Does anyone wish to ask any questions, or to say anything about this Zeppelin Flying Machine? If so, will they do so at once.

MR. ALEXANDER: Ladies and Gentlemen,—As one of the assistants and observers of this balloon, I consider after 20 years of anxious thought and time in experimenting, the experiment so far as it went was a success. We got the balloon out of the balloon-house about 7.30 in the evening, and about 8 o'clock we got it up into the air. Its stability was maintained, and after we got the engines to work we got along at the rate of 18 miles an hour. It was not for long, I regret, because the

steering gear was carried away and one of the special rudders became unmanageable; we lost control of the machine, and we had to come down. That is the result of the experiment in as few words as I can put it.

MR. ALEXANDER (in reply to a question as to the distance the balloon travelled): 3.5 miles. It was telegraphed, and I suppose someone left out the decimal point and it was put down as 35 miles.

MR. ALEXANDER (in reply to a question as to whether the balloon travelled with or against the wind): Against the wind. Lieut. Hildebrande took the speed of the wind. The balloon went with the wind for a few moments until we got the engines to work, and then it went against the wind, and then our steering gear gave way. I should like to lay emphasis on this point; that the stability of the balloon, which was 420 feet long, was perfect, and as far as the experiment was concerned it was very good indeed.

Member (name missed): I am sure it must be highly gratifying that we have heard the first authentic account in this room of one of the most remarkable experiments made in balloons. But could the gentleman translate the speed of the wind and the speed of the balloon into terms that one can understand. How much did the speed of the balloon exceed the speed of the wind? That is, against what speed of wind did the balloon travel and how quickly? It is the difference of course. It was going against the wind, and it is the difference between the speed of the balloon and the speed of the wind.

MR. ALEXANDER: The wind was blowing I should say about 16 miles an hour, and the balloon was going about two miles an hour. I have a lot of pictures and papers with details of the balloon here, and if anyone would care to see them, I shall be glad to show them; and I also have the chart here of the track of the balloon. I might say, too, that in this morning's "Leader," there are copies of the photographs which are quite true.

The CHAIRMAN: I am sure, ladies and gentlemen, that you will accord a vote of thanks to Mr. Maxim and to these gentlemen who have spoken on the subject of his notes. I will now ask the Rev. J. M. Bacon to illustrate by photographic lantern slides his "Cloud Photography from Balloons."

The REV. J. M. BACON: Mr. Chairman, Ladies and Gentlemen,—I must ask your indulgence with regard to these photographs, for they are somewhat hastily done. That has been a matter of necessity because I have been out of the country hunting the track of the eclipse in the southern States of America. Having once got into that country, I could not come back in a hurry, and I only left myself a very few days to produce the necessary slides to illustrate the short paper which I have put together.

CLOUD PHOTOGRAPHY FROM BALLOONS.

By the REV. J. M. BACON, F.R.A.S.

The aeronaut can scarcely turn his camera to better account than in the pursuit of cloud photography. Snap-shots of objects on the earth taken from short range overhead are generally more curious than interesting, and extended views from greater heights, however impressive to the observer, seldom make satisfactory photographs, not only through lack of detail, but owing also to the haze that too often veils the landscape at the height—say of 1,000 ft. and upwards. Speaking generally, through the greater part of any balloon voyage worthy of the name, successful views of the country are out of the question. On the other hand, on days that are not altogether cloudless, there is often opportunity at nearly all heights for interesting and valuable work in photographing all features of the cloudscape, from the mere withering cloudlet that wanders by to the piles and masses of dense cloud that make up the scenery of a full sky.

There are occasions, especially in early afternoons in summer, when there may appear no prospect whatever of any cloud photography. The sky may have been clear since early morning, and at the hour of starting usual in public balloon ascents, conditions as far as they can be judged of on the ground, seem all unchanged; yet the aeronaut may have the happy chance before the day's work is done, at some moment altogether unexpected, of securing some photograph of real value. Columns of warm moist air, however slender, are commonly ascending as the afternoon advances, and at almost any altitude a level may be reached, which is at the condensation point of the ascending vapour, when a cloud-wreath will inevitably form, even though its fate is to waste away again almost immediately.

Such cloud-wreaths may be almost imperceptible to an observer below. I have a note and also a photograph of an occasion, when, at about 1,000 ft. over the Crystal Palace, we were unexpectedly enveloped in a palpable cloud that utterly blotted out the Palace grounds; yet spectators in the grounds saw us all the while veiled only in what seemed to them the filmiest vapour. Directly after, the

cloud passed by us and we caught a ghost of a shadow of our balloon. This shadow in its entirety with its prismatic rings and complete outline—which must be perfectly familiar to my audience, most of whom, doubtless, like myself, have seen it in sunlight and also at night under a full moon—I have never succeeded in photographing satisfactorily. As illustrated in Mr. Glaisher's well-known volume it is to me exaggerated.

These anthelia seem common enough in Alpine regions and Polar seas, and it may only be necessary for the observer to be so located as to have the shadow of his head thrown by sunlight on to adjacent cloud, indeed, it is asserted that virtually the phenomenon, due simply to diffraction, is to be seen when a low sun throws the shadow of an observer's head on to grass heavy with dew. I submit, however, that if a certain amount of low temperature is not essential, at least *texture* of cloud has much to do with the number, vividness, and also chromatism of the rings.

This quality of cloud certainly would have everything to do with the sharpness of outline of a balloon shadow, and I would like to ask aeronauts present if they have ever seen a balloon shadow quite so substantial looking as one figured in Mr. Glaisher's book. I myself have not. I would also like to ask if others share an impression gathered by my companions and myself—that the balloon shadow seen coursing over the ground is more distinct under a bright moon than in daytime.

I had a rather exceptional opportunity of making an unbroken series of cloud observations during an aerial ride lasting nearly ten hours, in November last. The voyage was instructive throughout. We left the earth a little after 4 a.m. on Nov. 16, with a gentle wind from the east, the lower air being somewhat chill and dry. The sky was perfectly clear up to 1,500 ft., at which height we suddenly entered a dense cloud canopy which was comparatively warm and extraordinarily wetting. So extreme was the condensation of moisture on the balloon from this fog, that more than 3 cwt. of ballast had rapidly to be parted with to enable us to penetrate it, and to maintain ourselves in the clear air above its upper margin. We have all been made familiar with the great differences of humidity noticeable in different kinds of fogs. The densest London yellow fog is generally a dry fog. The ragged fringe of a nimbus cloud on the contrary may be all moisture, while the aeronaut, all in a brief interval and in the space of only a few thousand feet, may experience in cloud every grade of humidity. One record of an ascent of Mr. Glaisher's runs thus:—At two miles he encounters fog which a little higher becomes rain. Passing out of this he enters dry fog at 12,000 ft., and shortly after reaches a wetting fog. At 15,000 ft., the fog is less wetting. At 16,000 ft., it is dry; but at 18,000 ft., he is in wetting fog once more.

At 5.20 a.m. during the voyage I am referring to, having risen to 4,000 ft., I took the temperature carefully with a sling thermometer, and found it 42°, but half an hour later, having dropped a thousand feet, the temperature had fallen four degrees. We were now, however, on the actual upper margin of the cloud stratum where evaporation was going on very rapidly. As soon as light became strong enough all around us, wreaths and billows of mist were seen rising and vanishing into the clear dry air by a wholesale process of evaporation on such a giant scale that it is hard to understand how the cloud stratum maintained its mass and density for so many hours as it did unless it was constantly re-forming at a lower level. The photograph shown here represents the cloud as it appeared from a point about 2,000 ft. above its upper surface.

After this the sun asserted itself and drying off the moisture on the balloon, and warming the gas, we mounted up 1,000 ft. in every twenty minutes, and soon were looking down on the same cloud floor from an elevation of 9,200 ft.

I would point out two facts in this photograph (1) how smooth the surface now appears, and (2) what a dazzling flood of light is everywhere, giving a picture much over-exposed although taken with the quickest shutter.

As to the observed upper surface, the smoothness noticeable is certainly more apparent than real. We are now regarding it from a distance of a mile overhead, and we know, from the photograph last shown, that when seen from 1,000 or 2,000 ft., its texture is really broken and ragged. It is surely the same with the characteristic flat-bottomed cumulus clouds. When approached in a balloon the effect of the smoothed off under surface is lost and cannot be shown in a photograph.

Before dismissing the present slide I will ask attention to the overpowering light that floods the picture. We voyagers might well have been visited with snow blindness, and I can fully enter into an experience recorded by Mr. Glaisher. He had ascended on a rainy

day late in July when cloud was lying at all heights; but at 12,000 ft. he passed out of rain and overlooked a range of surrounding clouds so dazzlingly white that it was with difficulty he could read the instruments furnished with ivory scales.

After hours of a protracted voyage, having apparently encountered some cold blast blowing over the estuary of Severn, our balloon was spontaneously but very slowly creeping downwards, and at about 1 p.m. we were once more about 2,000 ft. above the cloud floor; but observe the difference. It is now breaking up into hollows under the hot sun. In other ways, too, its condition seemed different. We were expecting, not to say hoping, that as soon as we dipped into the upper fringe of cloud, the balloon, over which we had lost control, would become chilled and so descend more rapidly, but for a length of time this was not so, the fringe that had struck so chill at day-break was now only a warm vapour bath.

It is instructive to compare such clouds as we have been looking at at close quarters in the free heavens with others seen equally at close quarters, but contiguous to earth and at different elevations. We have here: (1) Mist over a river valley. (2) Cloud on a snow mountain. (3) Clouds surmounting a snow mountain. (Photograph shown.)

On the mountain side we doubtless get not a permanent cloud but rather mist that is being constantly dissipated and as constantly reformed.

The permanent cloud becomes clearly more compacted, especially so when under electrical tension as in the thunder pack or hailstorm cloud.

The formation of a flat-bottomed cloud was witnessed and figured by Mr. Whymper under peculiar circumstances. The strikingly flat-bottomed cloud is, in my experience, most pronounced when such cloud rests on a lower current blowing from the east.

It is found that atmospheric conditions greatly aid the work of the camera.

I have always conceived a distinction in the aspect of clouds over different portions of the globe, it being a well known fact, referred to by Nansen, and others, that the sky reflects the general tone of the country beneath.

Here is a photograph of the upper limit of a typical summer evening cloud. (Photograph shown.)

One last photograph taken in the fringe of cloud where the picture seemed hopeless from the veil of mist; but like the astronomer, finds a slight haze aid definition in an over-brilliant object like the moon, so, I imagine, the cloud fringe aided a picture which the near presence of water surface might otherwise have made over-exposed. (Photograph shown.)

The story was simply this.

The CHAIRMAN: Ladies and Gentlemen,—I am sure we are all much indebted to the Rev. Mr. Bacon for his very interesting paper and for these beautiful illustrations of it. If anyone wishes to ask him any questions, I am sure he will be happy to reply to them. At the same time I may mention that we have a longish programme before us and that we must get on as fast as we can.

The REV. J. M. BACON (in reply to a question whether the photographs were all snapshots): All entirely snapshots, except those reproduced from books.

The CHAIRMAN: The next paper that we have before us is on "Portable Electric Balloon Signalling in War," illustrated by lantern views, working models and experiments. I ask Mr. Bruce to give us his paper.

PORTABLE ELECTRIC BALLOON SIGNALLING IN WAR.

By ERIC STUART BRUCE, M.A. Oxon., F.R. Met. Soc.

Thirteen years ago, shortly after I had been privileged to supply the British Government with my Electric Signalling Balloon Apparatus, I showed upon the screen of the London Institution the same picture that is now before you. It represents the signallers of two friendly military forces shut in by high mountains. It shows how limited is the usefulness of the ordinary methods of visual signalling, which depend upon some vantage point for altitude; it shows how valuable in such a case is the electric signalling balloon. In the picture, the signallers on this side of the mountain are filling the balloon with gas for the ascent. On the other side, the balloon has already ascended. In the next picture both balloons have ascended to a considerable elevation, and the signallers are independent of the configuration of the country. I will now ask whether this picture does not partly represent the conditions realised so often during the South African Campaign, when our brave soldiers have been imprisoned so long amidst the rugged mountains of Natal, and where failure of communication has been the cause of disasters. But when I point out cases when the use of electric balloon signalling would be invaluable, I am not suggesting any negligence of the War Office or of those officials who are responsible for the efficiency of means of com-

munication. In fact, the utility of this system of balloon signalling has received acknowledgment from our Government experts, and the apparatus has been supplied to the Balloon Section of the British Army; forming part of the balloon equipment. And doubtless, in places such as Ladysmith, where the military observation balloon has been used, it has proved useful. The object of this paper is to suggest an increased usefulness of the system by the introduction of a still more portable form of the apparatus, which can be placed into the Signalling Department of the Army, as well as the Balloon Department, and which, from its mobility, can be taken into places and positions which are inaccessible to transport waggons. The principle of electric balloon signalling is now well known to the members of this Society. Inside a balloon of translucent material are placed several incandescent electric lamps. These are in metallic circuit with a source of electricity on the ground. In the circuit is placed an apparatus for making and breaking contact rapidly. By varying the duration of the flashes of light in the balloon by long or short depressions of the signalling key it is possible to signal sentences. On the screen I throw the image of a translucent balloon and simulate the method of signalling. I only flash one word "Baden Powell" (experiment shown).

Compared with an ordinary balloon transport, I have always described my signalling balloon as portable. Before you is a picture of a signalling balloon of 18 feet diameter taken at the Cork Military Tournament. This had a gas capacity of some 3,000 cubic feet, and it required about 30 tubes of compressed hydrogen to fill it, each tube being about eight feet long, five inches diameter, and weighing 70 lbs. But the exigencies of the present campaign has led me to devise a portable emergency balloon which can go wherever the signallers can go and yet will supply the means of obtaining a considerable degree of altitude for the signals.

To accomplish this, I have approached the impossible as far as I have dared, and in some parts of the apparatus strength and durability have had to be sacrificed to lightness. However, if a whole battalion can be saved by the use of an emergency balloon, this sacrifice would be justified even if the balloon could only be used once or twice. This, however, would not be the case, as such a balloon could be used a number of times.

To obtain lightness of the balloon I employ goldbeaters' skin instead of varnished cambric, the material of which my larger signalling balloons have been made. To raise a cambric balloon from the ground with coal gas would require a balloon of some 10 feet diameter, but a goldbeaters' skin balloon need only be a few inches in diameter to raise itself. On the screen is a fine example of a goldbeaters' skin balloon — the military observation balloon of the British Army—the most perfect observation war balloon in the world. Here we have a substantial structure in which layer upon layer of goldbeaters' skin is combined. In the case of the signalling balloon, for the sake of translucency, we must be content with three or four layers. Then the metal aluminium, the density of which is only 20.6 helps us to obtain our portable signalling balloon, for we can make the ladder frame on which our lamps are suspended of this material. To exemplify the gain for lightness, where a balloon is concerned, I hang a copper wire ring on this little balloon and it acts as a drag on its lifting power. The balloon does not rise. I substitute for it aluminium of the same size, and the balloon ascends (experiments shown).

Mobility is also afforded by improvements in storage batteries which have rendered them very portable. These two batteries contain six cells in each, and I will show how brilliant a light it is possible to get with these two portable batteries. I flash this incandescent lamp by means of my carbon contact signalling key. Such a battery as this would supply power for intermittent signalling for some weeks. It may be said that occasions might arise when batteries could not be renewed. In such cases I should propose a portable hand dynamo. From this table dynamo I can produce an electric light, and a little exaggeration of this arrangement would provide us with a source of electric power. I reckon that the smallest possible signalling balloon to be efficient would be a goldbeaters' skin balloon of seven feet diameter. This would lift a very light cable and one lamp a few hundred feet, and only require two gas tubes 120 cubic feet capacity for its inflation. A better size giving a more useful lifting power would be eight feet diameter. I consider that the emergency balloon might be even of 10 feet diameter without its transport being impracticable in places inaccessible to waggons.

It has often been urged that a signalling balloon is only of use in calm weather. The view on the screen which I am able to show you by permission of the "Daily Graphic," contradicts such a statement. It illustrates the use of electric signalling balloons in half a gale of wind on the evening I carried out

experiments at the Stamford Bridge Grounds in the presence of H.S.H. Prince Edward of Saxe-Weimar and a number of Military and Naval Experts of various nationalities. I accomplished the ascent by using a number of guy ropes. There are also possibilities in the combination of a kite with a balloon in windy weather. On the screen is the large kite which Mr. Douglas Archibald made for me some years ago. I have not, however, as yet, in my experiments adopted such a combination, as I have found guy ropes exceedingly efficient.

The next view shows the use of the electric balloon from board a ship, for such a method of signalling would be incalculable to the Navy. It would ensure signalling from below the horizon and round corners in coast defence. The last view shows the use of the balloon as a point light in Arctic exploration—a form of war indeed, but one that is in perfect harmony with civilisation—the international struggle against the forces of nature which are in opposition to the attainment of knowledge and the discovery of truth.

The CHAIRMAN: I think we shall agree that we shall have to thank Mr. Bruce for his very interesting paper. And now we are to have "The Weczera Flying Machine," by Mr. L. W. Broadwell, with exhibition of the model of the machine which has lately arrived from Hungary. We regret to find that Mr. Broadwell is ill and not able to read his paper; Mr. Bruce will therefore be kind enough to read it for him.

ANTON WECZERA'S FLYING MACHINE.

By L. W. BROADWELL.

Mr. Chairman and Gentlemen of the Aeronautical Society:—The flying machine—a working model of which I have now the honour to submit to your critical inspection—is the invention of M. Anton Weczera, a Hungarian architect, who has devoted many years to the study of a question which has such a special interest for your Honourable Society.

I, too, have devoted considerable attention to this subject; but whilst studying the construction of the many flying machines that dispense with the use of an air-bag, I have invariably failed to find in any of them an adequate and reliable lifting capacity, which, in my opinion, is the most essential element in all of them, and without which there can be no practical success.

Given, however, a method of construction which enables a machine to lift itself, together with its requisite cargo, and also to maintain itself at any desired level in the air, then there will be no difficulty in devising the necessary driving and guiding apparatus for it. Hence an effective combination of these three essential elements—viz. the lifting, driving and guiding—would certainly constitute a successful flying machine.

Now let us examine this model with a view to forming an accurate opinion of the most important among these three elements—viz. its *lifting* capacity—and if it be found to give a reasonable promise of success, then we may fairly claim to have gone far towards solving the momentous question of aerial navigation.

Many inventors have carefully studied the mechanical construction of birds' wings in the hope of utilizing the knowledge thus obtained in lifting and driving flying machines—but thus far in vain. The present model is also an effort in the same direction. There is no great difficulty in mechanically imitating the construction of a bird's wing, but no one has yet been able to manipulate and utilize such a combination as the birds do. The inventor of this model, however, claims to have done both, in a measure at least.

You will observe that the inclined planes or screw-blades in all the wheels of this machine have a downward fold at the outer edge or periphery thereof, in imitation of a similar feature existing in the formation of a bird's wing, and designed in both cases to *grasp*, as it were, the atmosphere in their downward and rearward sweep, which act lifts and propels both bird and machine—more or less in the case of the latter, according to the degree of inclination given to these artificial wings and the rapidity with which they are revolved.

These wheels are driven in opposite directions, that is, *inwards* towards each other, and are, thereby, made to co-operate in the tasks of lifting and propelling. When driven at a speed of 1,500 or more revolutions per minute they will probably accomplish all that is desired. This speed and more should be easily attained by the employment of a suitable motor, such, for instance, as that of Hon. Charles Parsons in his "Turbinia," which drives its nine double-bladed screw-propellers at a speed of 2,100 turns per minute, *under water*.

The large wheels are chiefly designed to lift the machine, and also to maintain it at any desired altitude by regulating the number of their revolutions. They can, moreover, be utilized to some extent in *propelling* the machine, though most of that work has to be done by the smaller wheels. These latter are

so mounted that they may be raised or lowered through the arc of a circle whilst in action—thereby becoming partly driving and partly guiding devices, and thus completing the machine in principle.

Doubtless, when constructing a large machine, many modifications of detail may be found necessary, as indeed in perfecting most inventions.

The inventor suggests that the coupling together of two such machines as the present model would be found advantageous.

The CHAIRMAN: As Mr. Broadwell was not able to be present this evening, he has deputed his son to explain it; but he has had very short notice and we have to thank him very much for what he has shown us. Our next business is "Foreign Communication—Dr. R. Danilewsky's Flying Machine" illustrated by photographs supplied by the inventor. This paper has been sent, and Mr. Bruce will be kind enough to read it for us.

DR. DANILEWSKY'S DIRIGIBLE FLYING MACHINE.

I have lately received several communications from Dr. Danilewsky concerning his combined balloon and aeroplane. The latter of these are in the form of pamphlets in Russian and in German, and as these are too lengthy to read in full, I have by me a few short remarks to give some idea of the matter of these pamphlets, and to explain the photographs. Dr. Danilewsky calls his apparatus a "Dirigeable Flying Machine"; and on the occasion of his experiments for the Russian Government, the authorities present expressed surprise at the ease with which the machine was guided. From a study of the plans of the mechanism, it seems to me that Dr. Danilewsky has certainly attained to a simple means of controlling at will the movement of the machine, not only horizontally, but vertically, as long as the wind is light. I believe he does not as yet claim to guide the flying machine against a strong wind.

Dr. Danilewsky states in his pamphlet that he is not as yet satisfied with the simplicity of his guiding arrangements. He thinks simplicity so essential to safety that he wishes to eliminate both chains and wheels.

The apparatus consists of an elongated balloon placed vertically, an aeroplane, and steering apparatus, with seat for the aeronaut. I now show you a photograph of the machine in mid-air, which was sent me by Dr. Danilewsky. The vital principle of the whole machine and the reason for the existence of the balloon is the neutralisation of the weight of the man, the aeroplane, and the steering mechanism. But there must be no excess of lifting power. There were two accidents, in October '97 and October '99 respectively, which Dr. Danilewsky attributes to incorrect equilibrium and to the machine being lighter than the air. The aeroplane is a four-cornered bamboo framework on which are cross wings or shutters; these can be moved by simple apparatus to the desired angle and automatically fixed. These shutters are also a framework covered loosely with silk. The steering apparatus worked like a velocipede by the feet of the aeronaut by means of a chain and gearing arrangement, which carries the motion on to a form of screw; at both ends of this are cross pieces on which are four flat plates, two at each end. Each of these plates is a hexagonal framework covered loosely with silk. They are made to revolve and beat the air, striking it first flatly, and then in the upper portion of their revolution they cut the air as they strike across it. There are means on either side of the aeronaut by which he can direct the moving-power upwards, downwards, forwards, or backwards. The number of single impulses on the air of these hexagonal surfaces in quick work is about 16 per second.

DISCUSSION.

The CHAIRMAN: Does anyone wish to make any remarks upon these papers?

COLONEL ALLAN CUNNINGHAM: I should like to say that I have been present at a trial of a military balloon with a kite attached, Mr. Archibald's own. He was present and put the kite on with his own hands. The circumstances were rather unfavourable to him. I am bound to say the fact is that there are so many strings to the kite that it is rather a difficult thing to attach the kite to the balloon at all. Then, when attached, there is still a good many practical difficulties in the way of handling the balloon, so that the two things together do not form a handy combination. The idea of the mixture is very good theoretically; that is to say, the balloon is a very inconvenient thing to handle in a high wind, whereas the kite acts best in a high wind, so that it seems the combination might do very well in a high wind. But they are very difficult to work together. On that occasion the combination of the balloon and kite was not successful; it was not at all a convenient combination. It was a great many years ago I saw it, and I have not heard of any great success since. Then there are two questions I want to ask for information. One is about the "Emergency Balloons"—Mr.

Bruce's own—I did not catch what the size of the smallest "Emergency Balloon" suitable for work would be. Then as to the little difficulty that the particular balloons tried to-night had in rising, I would just like to remark that the barometer is very high to-night and the pressure of the air must be very considerable. It would seem that there must be something heavy in the gas. The ordinary gas of the quality used for balloon ascents ought to be more efficient than usual with such a heavy barometer as we have now.

MR. BRUCE: As far as the question of the kites is concerned, it has not been my idea to combine the two. I find guy ropes most effective. I mentioned the possibility because I think it is fair to mention everything that might be utilized. The combination has not been my method of raising balloons in windy weather, although, of course, I perfectly admit the tremendous value of kites by themselves for various purposes. I shall show some photographs presently depicting Major Baden-Powell's use of kites for wireless telegraphy at the front, where they have been of tremendous value. I am glad to see Mr. Douglas Archibald here, who made the large kite for me. He was the first to make a kite for meteorological experiments. I have just had sent to me by Mr. Rotch from Blue Hill Observatory particulars of his latest triumphs in the way of kites, but I have not had time to read them yet; at the same time, I believe he has succeeded tremendously, and I hope to put the paper in the next number of the Aeronautical Journal. I have also just received the report of the "Weather Bureau Kite Observations" of 1898 from the United States, and it will be seen they have aided meteorology immensely.

The CHAIRMAN: Would Prof. Langley favour us with any remarks?

PROFESSOR LANGLEY: I am extremely obliged, Mr. Chairman, for the reference made to me; but really, I have nothing that can add to the interest of the very interesting communications that we have heard to-night.

MR. DOUGLAS ARCHIBALD: May I say a word? Colonel Cunningham referred to the kite and balloon together. I might explain that the combination was originally thought out, but what he saw was a very rough preliminary notion of how to mix the two together. If the details were worked out, and the whole thing worked in a more workmanlike way than it was on that occasion, I do not see any reason why the difficulties that he mentions might not be got over. At the same time I confess that I have never had the time or the inclination to carry out the kite balloon any further than just to put the idea forward, and since then kites have themselves done such splendid work. For meteorological purposes, they appear to me to be the very best means we have of exploring the upper regions, better even than balloons, that I am quite content to let the kite-balloon go by. I may say, in reference to what Mr. Bruce mentioned just now about Mr. Rotch's experiment in America, that I think it is only fair to say that he began after he saw mine in England. I think he has achieved, through the help of Mr. Clayton, some of the best investigations that have yet been made of the upper regions. Lately, they have reached the height of 14,000 feet with instruments, and that is as high as one would care to fly a kite—an enormous height—and they have been able to take observations of the heavens at that height, and they have made some very interesting discoveries of the nature of the currents of the atmosphere, which will also help balloonists and flying machinists, and, I think, both those sciences will help each other. I should like to ask Mr. Bacon if he has ever noticed in the cloudy strata that he has got greater velocity than either before or after, because the observations of Bluehill seem to show that it occured either above or below the cloudy stratum. Perhaps he has not taken observations from that point. But it shows that we are learning by means of kite observations things that would be impossible by other means. And a great deal of this work of the last paper that has come over from Mr. Rotch, I think, is as important a contribution to the science of metereology as anything I have seen for the last 20 years.

Member (name missed): I should like to know with regard to the Danilewsky Flying Machine whether there was any data as to the velocity with which it could be guided by means of the interesting apparatus we saw on the screen. The mechanical part of it is apparently so out of proportion to the mass which has to be propelled through the air that it does not seem that any very high velocity could be attained. Then, with regard to the use of aluminium in signalling balloons. I think it is now a matter that has been almost solved by engineers that steel is a stronger metal strength for strength and weight for weight, so that there is really no object in using aluminium. I think that is Mr. Maxim's experience. I should like to know why aluminium is still used.

MR. BRUCE: You could not get the balloon up with steel. We do not want great strength, we want lightness. Aluminium is the lightest.

Member: That is the point raised. I say steel is lighter than aluminium strength for strength.

MR. BRUCE: But if you make that ladder of steel, you cannot have it very much finer than the one we have here.

Another Speaker: I imagine it is rigidity you want. If you made it of steel you would not have the same rigidity; steel wire might be lighter and stronger than your aluminium, but you would not get the same rigidity.

MR. BRUCE: Yes, that is so.

MR. BRUCE: I am very anxious to show the meeting the photographs of Major Baden-Powell's experiments at the front with his kites. I am indebted to Miss Baden-Powell for sending me these pictures, and I am able to show them to you by the kindness of the editor of "The King" who has lent them to the Aeronautical Society for the use of this evening.

MR. BRUCE then exhibited a number of pictures illustrating Major Baden-Powell's experiments at the front.

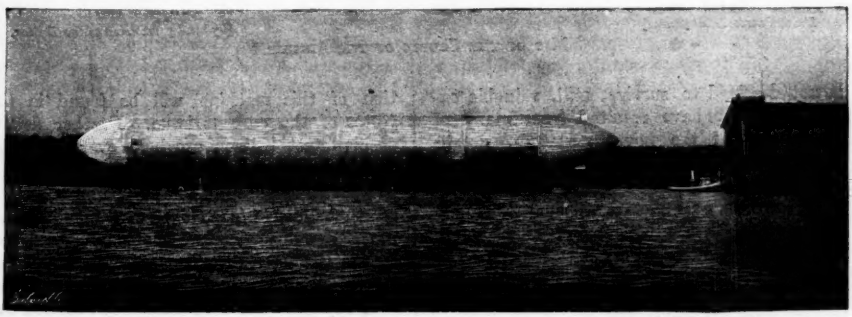
MR. BRUCE: Before we separate, there is one point I wish to speak about, and that is about the Paris International Congress. When I was over in Paris, I was most hospitably received by the French Aeronautical Society, and I am very glad we are going to be represented at the Congress. Some of our members are down on the list, but there ought to be more, because it is one of the most important Congresses ever held. I am sure we are all agreed that it is most important in the progress of aeronautics to have international consultation and international agreement on scientific subjects.

The CHAIRMAN: Ladies and Gentlemen,—After the very interesting papers and illustrations we have seen this evening, we have to thank those gentlemen who have interested us so much. I do not propose to detain you any length of time, but I may mention one thing, and that is that in France they are working very hard at this problem, and we are informed that the Aero Club in France has offered a prize of 100,000 francs to the aeronaut who, either in a balloon or a flying machine, starts from the ground and makes a journey round the Eiffel Tower and returns within an hour. It is a distance of about six miles. I shall not detain you with any further remarks, but thank you for your attendance here this evening.

A vote of thanks to the Chairman, proposed by Mr. Hiram Maxim, terminated the proceedings.

Aeronautics in 1900.

The present year has been remarkable for aeronautical enterprise and experiment. The greatest achievement, no doubt, has been the trial trip of the Zeppelin Airship, which has been fully chronicled over and over again in the daily papers, and the periodicals. As has often been the case in aerial experiments, the results of the trial trip were, at first, exaggerated, and the news that first came to hand stated that the Zeppelin Airship had journeyed 35 miles against the wind. No wonder was it therefore that some daily papers announced that the solution of the problem of aerial navigation had been accomplished by the venerable German Count. But the illusion was dispelled in this country at the meeting of the Aeronautical Society on July 17th, when Mr. P. T. Alexander, who was replying to Mr. Maxim's paper on the Zeppelin Airship, stated that the distance was really only 3.5 miles, the decimal point having escaped



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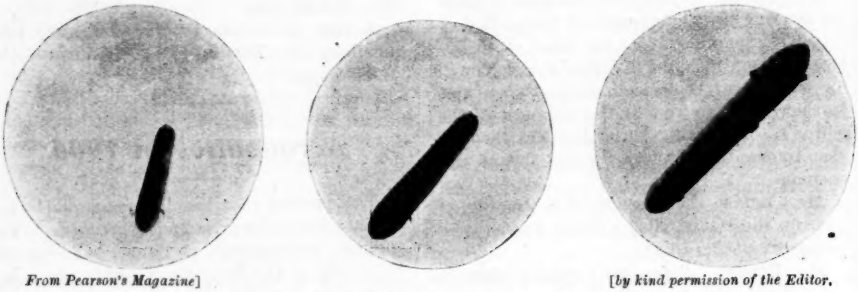
THE AIRSHIP AT REST JUST OUTSIDE ITS SHED.

the notice of the telegraphists. Disappointment at hearing the truth, has caused some writers to go to another extreme, and disparage the experiment as a failure. A wiser course is the avoidance of either extreme of criticism. The first journey of the Zeppelin Airship cannot be said to have solved the problem of steering a balloon against a considerable wind, but it has, all the same, been a well-designed and ably-executed experiment, and even if the particular form of the airship is not destined to survive, still, valuable experience must have resulted from many of the details of the novel structure, details which have already been so carefully described in this journal by Major Baden-Powell.* To take but one example, it appears that the fabric of which the balloons of airships are made, are exceptionally gastight. The Zeppelin experiment was worth all the money bestowed on it, if a really gastight material has been its only outcome.

The Aeronautical Journal has received many photographs and illustrations of the Zeppelin Airship. These illustrations are published in the current number, which are considered to be the best. These appeared in the September number of "Pearson's Magazine," and they are now reproduced by kind permission of the editor.

Next to the Zeppelin Airship, M. Santos Dumont's motor balloon is, perhaps, attracting most of the attention of experts. A mention of this machine will be found in the Notes of the current issue. Further details of his latest balloon are held over until the next issue of this journal.

Apart from the attempts being made to render balloons independent of wind direction, much excellent work has been carried out during the year with the ordinary balloon in its primitive unsteerable condition, and the long voyages that have lately been carried out on the Continent certainly testify to an increase of skill on the part of modern aeronauts.



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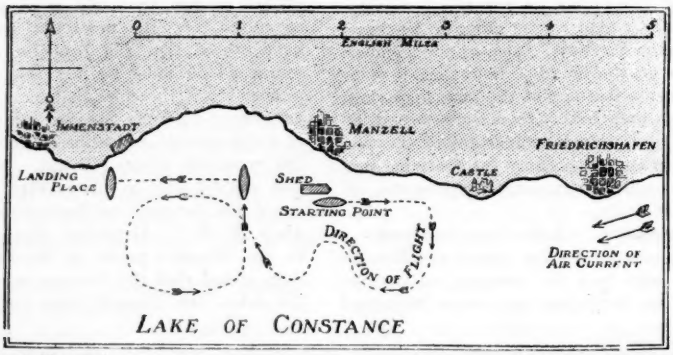
THREE SNAPSHOTS OF THE AIRSHIP DURING ITS FIRST VOYAGE.



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MAP OF THE COURSE OF THE AIRSHIP.

* The Zeppelin Airship, AERONAUTICAL JOURNAL, Oct., 1899.

The example of recent skill in balloon manipulation is given in another column of the Journal, where M. Jacques Faure's successful balloon voyage across the Channel in September last is chronicled. This latter journey is especially worthy of note, as it was a pleasant instance of International work and co-operation in the carrying out of aerial experiments. During this year in this country, the Rev. J. M. Bacon has greatly extended his past experiences as a scientific balloonist. One of his ascents took place in a thunderstorm, and this fact has been the cause of much interesting correspondence in scientific and other journals, as to the possibilities of balloons being struck by lightning. Besides the experiments in the open, with flying machines and balloons, the less sensational experiments having a bearing on important aeronautical matters, and which have been carried on in the laboratory, demand the earnest attention of students. In another part of the journal will be found an account of the experiments of Messrs. W. G. Walker and P. T. Alexander, on "The Lifting Power of Air Propellors," a perusal of which will render evident the fact that in 1900 the science of aeronautics is not the pursuit of the fanciful or of the dreamer, but of the stern and matter-of-fact experimentalist.

M. Jacques Faure's Balloon Voyage across the Channel.

On September 1st, M. Jacques Faure, the treasurer of the Paris Aero Club, accompanied by Count Kargarion, ascended from the grounds of the Crystal Palace in his balloon "L'Orient," for the purpose of crossing the Channel. The local arrangements for the ascent were made by the Aeronautical Society of Great Britain at the request of "La Societe Francaise de Navigation Aerienne," Mr. Henry Gillman, the present excellent and most energetic manager of the Crystal Palace having generously placed the historic balloon ground of that establishment at the disposal of the French aeronauts. There is no place in the United Kingdom where a balloon can be so promptly inflated as at the Crystal Palace, and the operations of its highly-trained staff received the highest commendation from M. Faure. M. Mallet, the Parisian aeronaut, who had journeyed from Paris in charge of the balloon, superintended all the arrangements preparatory to the ascent. On the morning of September 3rd, a telegram was received by Mr. Eric Stuart Bruce, the Honorary Secretary of the Aeronautical Society of Great Britain, from M. Faure to the effect that the aeronauts had safely crossed the Channel and descended at Alettes, near Boulogne. A telegram from the Aeronautical Society of Great Britain was immediately despatched to M. Faure, congratulating him on his successful voyage.

Mr. Eric Stuart Bruce since received the following kind letter from M. Faure, descriptive of his voyage, and showing his appreciation of the aid he received from the British Aeronautical Society. This is translated from the French by Helen Auxilium Bruce.

10, Rue La Fayette, Paris,
Sept. 3rd.

Dear Sir,—I confirm in this my telegram of yesterday in which I informed you that I had fortunately landed at Alettes, a little village in the department of Pas de Calais between Etaples and Montreuil-sur-Mer. I must first thank you for all your kind help in facilitating my departure from London, and I feel that it is to you that I owe much of the success of my enterprise.

Leaving the Crystal Palace at 7.30, I easily found my level at about 100 metres up, so that I was able to communicate with the earth several times, and so ascertained my whereabouts. Thus, I found I passed exactly over the tower of St. Mary Crey, and travelled right down the county of Kent, recognising on my left the Thames lighthouses, so that I think I struck the sea between Deal and Sandwich at about 11 p.m. The wind was favourable, so I did not hesitate to attempt the crossing of the straits and taking the precaution of mounting to about 700 metres, and maintaining that altitude so that I might be able to note my direction by the stars, it appeared to me that I went continuously south-east. At 2.30 I saw, on the left, a lighthouse that I knew later on to be that of Boulogne. I followed the French coast from Boulogne to the mouth of the Canche, hearing on my left the sounds of earth, the railway trains, and the barking of dogs, etc., and on my right the rise and fall of the sea.

I effected a landing under good conditions at 3.20 in the morning near the little village of Alettes. As you see, my journey was accomplished under the best conditions and with no incidental accident. I hope, Monsieur, to have the pleasure of seeing you when you come to Paris for the Aeronautical Congress, so that I may thank you personally for all you did for me. Yours, &c.,

JACQUES FAURE.

The Recent High Kite Ascents at the Blue Hill Observatory.

Mr. Lawrence Rotch, of the Blue Hill Observatory, has communicated the results obtained in two very high Hargrave Kite flights, which have beaten the record of the ascents at the Meteorological Observatory. On June 19th, the altitude of 14,000 feet was reached. This exceeded the greatest height previously obtained at this observatory by 1,440 feet. At this height the temperature was 15 degrees below the freezing point, the wind velocity was 25 miles an hour from the North-East, and the air was very dry. The kites remained near the highest point from 5 to 8 p.m., when they were reeled in rapidly by a small engine. In the descent the kites passed through a stratum of thin ragged clouds at a height of half a mile. These were moving with a velocity of some 30 miles an hour. At this time the wind at the observatory, situated about 600 feet above the general level of the surrounding country, had fallen to a calm.

But even this record is broken in the second ascent described by Mr. Rotch. On July 19th, the kites attained a height of 15,900 feet above the sea level. The recording instruments attached to the kites showed freezing temperature at the highest point, and a North-East wind with a velocity of 26 miles an hour. The air was again found to be very dry.

The Paris International Aeronautical Congress.

This important event took place from September 15th—20th at Meudon. Amongst the members of the Aeronautical Society who contributed papers were M. Eric Stuart Bruce, who contributed a paper on "Electric Balloon Signalling in Arctic and Antarctic Exploration," and Mr. P. Y. Alexander. This latter gentleman forms one of the voyagers in Dr. Berson's great balloon ascending from Berlin. Just on going to press a telegram has been received from him from Friedenau dated September 24th: "Leaving to-night 5.53, direction East."

The details of the work of the Paris Congress must, from want of space, be held over until the January issue.

Lifting Power of Air Propellers, being Experiments with Propellers 30 ft. in Diameter.

By William George Walker, A.M.I.C.E., M.I.M.E.

These experiments were carried out during the latter part of 1899, with the expert and financial assistance of Mr. Patrick Y. Alexander, of Experimental Works, Bath.

Experimental Apparatus. Five propellers 30 feet in diameter were tried, lettered A., B., C., D., E., the skeleton structure of the blades was also tested, the different propellers were formed by altering the canvas stretched on the skeleton blades. The skeleton propeller was made as light as possible, and for reasons of strength and lightness, a Mangin type of propeller was used of four blades, the blades being fixed one behind the other, and connected together by diagonal struts and ties; the blades were 3 feet 1½ inches apart. A pair of blades are thus, from a structural point of view, similar to a "warren" or lattice girder supported at one end, the respective blades of one pair constituting the upper and lower flanges of the girder; therefore, when the propeller is exerting a thrust, the members of one blade will be in compression, and the other in tension. The blade-frames are made of solid drawn steel tubes of best quality and of different diameters and gauges, the tubes are joined together by brazed sockets. The width of the blade frame was 6 feet with a length of 15 feet.

The propeller was mounted on a horizontal shaft 4 ins. in diameter, and driven by a portable engine by means of a six-inch belt. The diameter of the engine cylinder was 8¾ inches with a stroke of 12 inches. The boiler pressure varied between 60 and 75 pounds per square inch. The driven pulley on the propeller shaft was 5 feet in diameter. Several pulleys of different diameters were employed on the engine, varying from 2 feet to 3 feet in diameter. With smaller diameter pulleys the belt was found to slip somewhat at the high speeds. Practically no slip occurred during the present readings with the larger diameter pulleys.

The propeller shaft was free to move in its bearings longitudinally, a powerful ante-friction swivel was attached to the end of the shaft on the discharge side of the propeller to

which was attached a Salters balance capable of reading up to a pull of 1,000 pounds, and reading to a pound a movement of 1½ inches of the shaft was sufficient to move the needle right round from zero to 1,000. The balance was tested by means of weights before and after the experiments. The propeller shaft ran very freely in its bearings, requiring only a few lbs. thrust to move it horizontally when revolving.

Propellers. The five propellers tried which are lettered A. to E., all 30 feet in diameter. Propellers A. to D. had their blade surface set at an angle of 12½ degrees to the plane of rotation. Propeller E. was set at an angle of 21 degrees.

A. had four blades each 6 feet wide, giving an area of 350 square feet.

B. had two blades each 6 feet wide, giving an area of 175 square feet.

C. had four blades 3 feet wide each, giving an area of 175 square feet formed by stretching the canvas on half the longitudinal length of the blade structure.

D. had four blades 3 feet wide each, giving an area of 103 square feet similar to C., but with 6 feet radius of blade surface removed from each blade, leaving four tips 9 feet long by 3 feet wide.

E. had four blades exactly the same as A., only set at an angle of 21 degrees to the plane of rotation.

Experimental Building. The room was 210 feet long, 68 feet wide, and 60 feet high. The axis of the propeller was nearly central with that of the room and 17 feet above the floor surface, the centre of the propeller being about 30 feet from one end of the room, arranged so to feed from the wall's side. The air space was ample for the proper circulation of the air. The disc area of the propellers was 707 square feet, while the sectional area of the room in same plane as propeller was 3,600, leaving an area of 2,893 square feet for the flow of air back into the propeller. The air was discharged in the form of a cylindrical column about 30 feet in diameter down the long room, returning by the walls and passing the propeller through the disc area of 2,893 square feet and again into the propeller.

Mode of Experiment. Each propeller was tested at about 10 different speeds (including the skeleton blades) varying from 20 to 60 revolutions per minute. The thrust in pounds, revolutions of propeller and engine, together with an indicator diagram, and steam pressure were taken simultaneously for each different speed. These experimental readings are given in tables 1 to 8. A Crosby Steam Indicator was used, which was compared with a Richards Indicator, and found to agree. Tables 1 to 6 give results for propeller speeds of 20, 25, 30, 35, 40, 45, 50, 55, and 60 revolutions per minute.

The friction of the unloaded engine was also obtained, which includes the friction of the belt and propeller shaft, obtained by removing the propeller and running the engine light at progressive speeds. The mechanical efficiency of the engine, belting, and shafting was obtained for different loads by means of a brake dynamometer applied to the propeller shaft; this efficiency multiplied by the I.H.P. gives us the B.H.P. for that particular H.P. Every care was taken so that the results should be as accurate as possible, and the readings were taken by a staff of four observers.

Tabulating Results. Referring to tables 1 to 5. The tip speed corresponding to the revolutions is given. The total I.H.P., the brake and power to overcome the friction of the unloaded engine has been given. The power necessary to overcome friction due to working load may be obtained by adding friction and subtracting the results from the I.H.P. The thrust in lbs. per I.H.P. and B.H.P. are inserted.

Examination of Results. Taking the experiments as a whole, and making allowances for experimental errors, the following relations are verified.

(1). The thrust varies as the square of the revolutions.

(2). The H.P. varies as the cube of the revolutions.

(3). The thrust per H.P. varies inversely as the revolutions.

For a given I.H.P., E. gave the greatest thrust, at 16 I.H.P. the thrust was 260 lbs., A and C 212 lbs., D. 192 lbs., B. 132 lbs. respectively. At the same number of revolutions A. gave about double the thrust of B.

For equal tip speeds the thrust per H.P. for propellers C. and E. were nearly equal. Propeller B. of two blades was the least efficient of the series.

The thrust per I.H.P. of B. and E. at 50 revolutions per minute was 9.4 and 15 respectively. E. required 18.7 I.H.P. to drive it at 50 revolutions, while the I.H.P., absorbed by the skeleton propeller, was 7.8, and that of the unloaded engine 2.05 I.H.P.

Measurements of Air Discharged. The velocity of the air at different points entering as well as on leaving the propellers B. and E. was measured. Anemometer readings were taken at a distance of 2 feet in front of the propellers, as well as behind, and at intervals

of 2 feet. No delivering tube was employed, the propeller being entirely open in front as well as behind. The air on the delivery side at the distance of 24 inches, at which the readings were taken, had no tendency to spread beyond a radius slightly greater than the extreme radius of the blades. The velocity of air at different points on the delivery side is given in tables 7 and 8. From all points behind the propeller, the air is sucked into the rarefied spaces left by the revolving blades and discharged in an axial direction in the shape of a cylindrical column of air having a spiral motion, the pitch of the spiral depending upon the angle at which the blades are set.

The cross section of the propeller disc on the delivery side was divided into eight imaginary concentric rings, and anemometer readings were taken at the following radii, which correspond to the centre line of the rings, viz., 2, 4, 6, 8, 10, 12, 14, and 16 feet. The velocity of air in feet per minute as ascertained at each of the 8 radii, was multiplied by the area of the corresponding rings in square feet; and the product being added together, gave the number of cubic feet of air discharged per minute. Propeller B. discharged 233,230 cubic feet of air per minute at 35 revolutions, and 3.8 I.H.P. giving a thrust of 42 pounds. Propeller E. discharged 363,140 cubic feet at 32½ revolutions per minute, requiring .58 I.H.P., and giving a thrust of 120 pounds.

The thrust may be approximately calculated at different radii from the amount of air discharged at the respective points.

It will be noticed that the thrust per unit area is a maximum near the tips, and rapidly falls off near the central parts.

Weight and Strength of Propellers. The weight of the propellers was about 120 lbs. each, not including the canvas. The propeller was designed strong enough for a thrust of 600 lbs. at a factor safety of 3½. Taking the steel tubes at 30 tons per square inch, a formula was employed suitable for long columns and pin joints, whereas the tubes might be taken as short columns and stiffened joints, this would give a much higher strength. The author has no reliable data on the compressive strength of short tubes, and, therefore, made use of results more suitable for long ones.

The strength of the blades were tested statically by loading the extreme tips with weights. The deflection curves are shown in Fig. 14 for axial strength or thrust and twisting strength. The plotting shows the limit of elasticity was not reached. This was experimentally verified, for all loades up to breaking, which was due to one of the brazed sockets giving out, with 600 lbs. suspended from the tip of a blade in an axial direction. The twisting strength of the blade was not tested to breaking point. It is clear that by making the sockets of malleable iron instead of gun metal, the weight could have been materially reduced.

Discussion on Results. Comparing A. and B., it will be noticed that the proximity of the wide blades arranged, "Mangin" type did not reduce the thrusting power of the propellers, for at the same number of revolutions A. gave practically double the thrust of B. C. had four narrow blades of a total area of 175 square feet, while A. had the same number of blades but of double the width and an area of 350 square feet, yet their efficiencies were about equal. This seems to show that within certain limits narrow blades are quite as efficient as wider ones, giving the same total thrust at equal tip speeds. D. had 6 feet length of each blade removed from the central parts, otherwise, the propeller was similar to C. At 50 revolutions per minute the thrust of C. and D. was 159 to 148 respectively. With 16 I.H.P. the thrust of D. was 20 less than C., showing that the area of the central parts of the propeller is not very effective. The skeleton blade absorbed a considerable amount of power. At 50 revolutions, the power necessary to drive the skeleton was 60 per cent. of the power necessary to drive A. at the same speed. So that the application of 350 square feet of canvas only required only 5 extra H.P., and to give a thrust of 186 pounds.

Design of Propellers. In the design of suitable lifting propellers for aeronautical purposes, there are many practical and theoretical points to be considered. For instance, it would not be economical to arrange for too high a thrust per H.P. due to consideration of the weight of propellers. Taking into account the weight of the propeller, there is a particular thrust per H.P. which will give the highest efficiency. The experiments give data sufficient for the design of any other size of propeller, and even of distinctly different design within certain limits. It is clear that the thrust and H.P. can be approximately arrived at for any particular speed. For instance, to drive propeller E. at 100 revolutions per minute, it would require about 100 B.H.P., and give a thrust of 1,125 pounds. It is not the author's intention in this report to go into the design of a propeller, although, perhaps, a few brief particulars of the line of action may be interesting.

Referring to propeller E. at 45 revolutions per minute, it gave a thrust of 240 lbs. with 14 I.H.P., or at 17.1 lbs. per I.H.P. Now this figure can be considerably improved—

(1). By reducing the skin friction of the surface.

(2). By reducing the resistance of the blade structure.

By making the blades half the width, which can be done without reducing the efficiency, the first loss may be approximately halved. This will also concurrently reduce the loss in the second quantity. The experiments showed that the resistance of the structure was excessive, which can be reduced by eliminating some of the diagonals and other struts near the tips. The presence of struts in the central parts absorbs comparatively little power, and their number if necessary may be augmented. As far as possible the blades at the tips should only be strengthened by wire.

For the sake of example, suppose this loss is reduced 2 I.H.P. in the case of propeller E. at 45 revolutions per minute, bringing it to 12 I.H.P. Again, in this particular case, loss in friction, due to belt and engine, was 30 per cent., so that we may approximately say that with this particular type of propeller 11 I.H.P. will give a thrust of 240 lbs., or a thrust of about 21 lbs. per I.H.P. This will be equivalent to a thrust of 25 lbs. per B.H.P. Now, assuming that no loss occurs due to interference of the air when multiple blades are introduced, the thrust and H.P. will vary directly with the number of blades at same revolutions. Suppose, therefore, we arrange for 12 blades, this will give a thrust of 720 lbs., and require 33 I.H.P.; with 18 blades, the thrust would be 1,080 lbs., and the I.H.P. 49.5. Increasing the revolutions to 60 would give us a thrust in the latter case of 1,836 lbs., and would require 125 I.H.P.

Of course, by going in for a lower tip speed, the thrust per H.P. is proportionately greater.

Applying the 18 blades to a propeller of 50 feet in diameter, we have, running at 30 revolutions per minute, thrust 3,700 lbs., I.H.P. 190. At 20 revolutions per minute we have, thrust 1,640 lbs., I. H. P. 57.

The above calculations are made on the assumption that the surface and projections are nearly as rough as the experimental propellers. It seems clear that taking into consideration the resistance and lifting power of a smooth inclined surface, the allowances for friction losses is high, and that the power given, can, with ordinary care, be much reduced.

In considering whether the proximity of the blades will interfere with each other, it must be borne in mind—

(1). The diameter is large.

(2). The speed is small, the tips revolving at a large radius, approximating ordinary aeroplanes moving in a straight line.

The following nine papers by the author may be useful as reference: "Experiments on Screw-Propeller Surface," Inst. M.E., 1892; "Experiments on Ventilating Fans," British Association 1893; "Experiments on Propeller Ventilating Fans," Inst. M.E., 1897; "Supplementary Experiment Propeller Fans," Inst. M.E., 1897; "Speed Trials," British Association 1897; and "Lifting Power of Air Propellers," British Association 1899.

TABLE I.

PROPELLER A. DATE OF EXPERIMENT: OCTOBER 9TH, 1899.

4 WIDE BLADES. AREA, 350 SQUARE FEET. ANGLE OF BLADES, 12½ DEGREES.

Revolutions of Propeller per minute	20	25	30	35	40	45	50	55	60
Tip Speed in feet per minute ..	1,880	2,350	2,820	3,290	3,760	4,230	4,700	5,170	5,640
Thrust in Pounds	32	45	62	84	109	143	188	245	288
I.H.P.	1·1	2·1	3·4	5·1	7·2	9·7	12·8	16·6	20·8
B.H.P.	·4	1·1	2·1	3·4	4·9	6·8	8·9	11·6	14·6
Thrust per I.H.P.	29·1	21·4	18·2	16·5	15·2	14·7	14·5	14·7	13·8
Thrust per B.H.P.	74·7	40·3	29·6	24·8	22·0	21·0	20·7	21·0	19·7
H.P. Friction of Unloaded Engine	·7	·9	1·1	1·3	1·5	1·8	2·1	2·3	2·6

TABLE II.

PROPELLER B. DATE OF EXPERIMENT: OCTOBER 10TH, 1899.

2 WIDE BLADES. AREA, 175 SQUARE FEET. ANGLE OF BLADES, 12½ DEGREES.

Revolutions of Propeller per minute	20	25	30	35	40	45	50	55	60
Tip Speed in feet per minute ..	1,880	2,350	2,820	3,290	3,760	4,230	4,700	5,170	5,640
Thrust in Pounds	18	25	33	42	54	69	89	116	154
I.H.P.	1·1	1·7	2·7	3·8	5·3	7·2	9·5	13·0	17·6
B.H.P.	·4	·8	1·6	2·4	3·5	4·9	6·6	9·1	12·2
Thrust per I.H.P.	16·4	14·7	12·2	11·1	10·2	9·6	9·4	8·9	8·8
Thrust per B.H.P.	42·0	30·0	21·0	17·6	15·2	13·9	13·4	12·7	12·6
H.P. Friction of Unloaded Engine	·7	·9	1·1	1·3	1·5	1·8	2·1	2·3	2·6

TABLE III.

PROPELLER C. DATE OF EXPERIMENT: OCTOBER 12TH, 1899.

4 NARROW BLADES. AREA, 175 SQUARE FEET. ANGLE OF BLADES, 12½ DEGREES.

Revolutions of Propeller per minute	20	25	30	35	40	45	50	55	60
Tip Speed in feet per minute ..	1,880	2,350	2,820	3,290	3,760	4,230	4,700	5,170	5,640
Thrust in Pounds	30	43	58	77	101	127	159	198	244
I.H.P.	1·1	1·8	2·7	3·8	5·4	7·4	10·3	14·2	18·5
B.H.P.	·4	·9	1·6	2·4	3·6	5·2	7·2	10·0	12·9
Thrust per I.H.P.	27·3	23·9	21·5	20·5	18·5	17·1	15·4	13·9	13·2
Thrust per B.H.P.	70·0	47·8	37·0	32·2	27·5	24·6	22·0	19·8	18·8
H.P. Friction of Unloaded Engine	·7	·9	1·1	1·3	1·5	1·8	2·1	2·3	2·6

TABLE IV.

PROPELLER D. DATE OF EXPERIMENT: OCTOBER 13TH, 1899.

4 NARROW BLADES. AREA, 103 SQUARE FEET. BLADE-SURFACE REMOVED TO A RADIUS OF 6 FEET. ANGLE OF BLADES, 12½ DEGREES.

Revolutions of Propeller per minute	20	25	30	35	40	45	50	55	60
Tip Speed in feet per minute ..	1,880	2,350	2,820	3,290	3,760	4,230	4,700	5,170	5,640
Thrust in Pounds	23	35	50	69	92	118	148	186	224
I.H.P.	1·0	1·8	2·8	4·2	5·9	8·2	11·2	15·0	19·8
B.H.P.	·4	·9	1·6	2·7	4·0	5·7	7·8	10·5	13·9
Thrust per I.H.P.	23	19·4	17·9	16·4	15·6	14·4	13·3	12·4	11·3
Thrust per B.H.P.	62·8	38·8	30·6	25·4	22·9	20·6	19·0	17·7	16·1
H.P. Friction of Unloaded Engine	·7	·9	1·1	1·3	1·5	1·8	2·1	2·3	2·6

TABLE V.

PROPELLER E. DATE OF EXPERIMENT: OCTOBER 20TH, 1899.

4 WIDE BLADES. AREA, 350 SQUARE FEET. ANGLE OF BLADES, 21 DEGREES.

Revolutions of Propeller per minute	20	25	30	35	40	45	50	55	60
Tip Speed in feet per minute ..	1,880	2,350	2,820	3,290	3,760	4,230	4,700	5,170	5,640
Thrust in Pounds	55	77	104	136	179	240	280	340	405
I.H.P.	1·1	2·6	4·2	6·3	9·6	14·0	18·7	23·3	32·0
B.H.P.	·4	1·5	2·7	4·3	6·7	9·8	13·5	16·3	23·0
Thrust per B.H.P.	150	52	38·7	31·7	26·6	24·4	21·4	20·9	18·0
Thrust per I.H.P.	52·4	29·6	24·9	21·6	18·6	17·1	15·0	14·6	12·6
H.P. Friction of Unloaded Engine	·7	·9	1·1	1·3	1·5	1·8	2·1	2·3	2·6

TABLE VI.

SKELETON BLADES. DATE OF EXPERIMENT: OCTOBER 16TH, 1899.

ANGLE OF BLADES, 12½ DEGREES.

Revolutions of Propeller per minute	20	25	30	35	40	50	60	70	80
Tip Speed in feet per minute ..	1,880	2,350	2,820	3,290	3,760	4,700	5,640	6,580	7,520
I.H.P.	1·0	1·4	2·3	3·3	4·6	7·8	12·0	16·7	22·0
H.P. Friction of Unloaded Engine	·7	·9	1·1	1·3	1·5	2·1	2·6	3·3	4·1

TABLE VII.

PROPELLER B. DATE OF EXPERIMENT: OCTOBER 10TH, 1899.

AIR READINGS.

2 WIDE BLADES. AREA, 175 SQUARE FEET. ANGLE OF BLADES, 12½ DEGREES. AIR DISCHARGED PER MINUTE, 233,231 CUBIC FEET. REVOLUTIONS PER MINUTE, 35. THRUST, 42 POUNDS. INDICATED HORSE POWER, 3·8.

Radius in feet	2	4	6	8	10	12	14	16
Velocity of Air per minute	52	60	267	324	419	368	222	146

TABLE VIII.

PROPELLER E. DATE OF EXPERIMENT: OCTOBER 20TH, 1899.

AIR READINGS.

4 WIDE BLADES. AREA, 350 SQUARE FEET. ANGLE OF BLADES, 21 DEGREES. AIR DISCHARGED PER MINUTE, 363,144 CUBIC FEET. REVOLUTIONS PER MINUTE, 32½. THRUST, 120 POUNDS. INDICATED HORSE POWER, 5·8.

Radius in feet	2	4	6	8	10	12	14	16
Velocity of Air per minute	155	209	363	561	657	724	426	3½

NOTES.

The Balloon Ascent from the Top of the Righi.—One of the most remarkable balloon voyages recently undertaken has, undoubtedly, been Captain Spelterini's voyage over the Alps from the summit of the Righi, and it reflects the highest credit on this daring aeronaut. The difficulties of inflating a balloon at a height of 1,456 metres were alone a formidable task, as the balloon and its accessories had to be conveyed by the Arth-Righi Railway, the heaviest item being the 180 steel tubes of compressed hydrogen weighing more than 12,000 kilogrammes. During the inflation of the balloon on the afternoon of July 29th a terrible storm occurred, which in the evening developed into cyclonic violence reported to be unprecedented in these breeding places of storms. Trees were torn up. Telegraph and telephone wires were destroyed, the windows of houses and railway carriages were broken, the harvest was devastated, but the inflated balloon, strange to say, escaped injury owing to the skill of the aeronaut, who passed the night in flattening it against the ground by means of sacks of ballast hung to the network of the balloon. On August 1st the balloon ascended, carrying in the car three passengers—Captain Spelterini, M. Julius Ernst, and M. Emile Gautier. The start was made in a south-west wind, which took the aeronauts right over the large glaciers of the Canton of Glaris. The panoramic view is described as magnificent in an article by M. Gautier in the "Daily Express"—"To the right the whole map of Switzerland, as far as the French and German frontiers, lay spread out like a panorama stretching further than the eye could reach. On our right the whole chain of the Alps from Mount Blanc to the Tyrolean Alps extended their showy crests with the Mer de Glace, which one could see from a height of 4,000 metres. As we advanced we could see all this from another point of view. Soon we entered into the immeasurable. Below us several hundred metres was the famous Gloermisch, the smallest fissures of which could be distinguished under the splendid sunshine. We passed just over the point called Bächislock, leaving a little on one side the Rüche Gloermisch and the Vermelis-Gärtli. It was with inexpressible joy and exultation that we felt ourselves thus soaring above these deserts of ice, untrodden by the foot of man, and upon which no human eye had even looked down. The descent was the most critical part of the voyage. It took place on the Gnuetseven, a peak about 5,200 feet high, and situated in the Canton of Glaris. Monsieur Emile Gautier thus describes the prospect of the desert: "Everywhere peaks, grim and forbidding, rose up like a forest of spikes that offered a foothold to nothing but the chamois. One tiny speck of green, and one only, could be detected." On this tiny speck of green the descent was made. This was in reality a small plateau about 50 square yards in extent, surrounded on every side by abysses that yawned hundreds of feet deep. Monsieur Emile Gautier hardly exaggerated the aeronaut's abilities when he said: "He handles the balloon as easily as if it were a bicycle, and he directed our descent upon the spot selected with the certainty of a marksman aiming at the target."

Wireless Telegraphy Experiments from a Balloon.—According to the "Leeds Mercury," the scientific balloon ascent by the Rev. J. M. Bacon was the most popular item in the programme of the garden party given by the Bradford Corporation at Lister in connection with the meeting of the British Association. The chief feature of the ascent was the experiment in wireless telegraphy, which included an attempt to establish communication with, and receive messages from, a balloon retreating into space. The arrangement for the experiment was that on release the occupants of the car should utilize the first five minutes in lowering their line 150 feet in length and firing a cartridge attached to a tree in the park. The second five minutes was to be spent in sending messages from the earth to the balloon, and the third five minutes in the attempt of the balloonists to send messages to the earth. The first item of the programme was completely successful, the cartridge, which was connected by wire with the receiver, being fired two minutes after the balloon had left the earth. Regarding the other plans the period of five minutes allowed turned out to be too long, for, owing to the brisk breeze blowing, in ten minutes the balloon had become a mere speck as seen from the park, and no messages were received from it. A telegram, however, was received from Mr. Bacon in the evening stating that signals had been received from earth by the occupants of the car at a distance of 20 miles from Bradford.

Fatal Balloon Accident at Naples.—There have been a particularly large number of

successful balloon ascents during the past summer, but the balloon season has not been altogether free from disaster. A fatal balloon voyage was lately reported from Naples by the correspondent of the "Daily News," in which both the aeronaut and a journalist who accompanied him were drowned. On a Sunday evening in July, Captain Venni, accompanied by Count di Montecupo, and a young reporter, Signor Pellizoni, ascended in a balloon from the grounds of the Exhibition in the Villa Communale. The balloon rose to some four thousand feet, and was slowly wafted out to sea. When between Capri and Ischia the aeronaut decided to descend, hoping to make contact with the water near Capri, but he miscalculated the distance and found that they had descended five miles away. When the car dipped into the sea the voyagers clung to the ropes and tried in vain to call the attention of a passing mail boat. For five hours they struggled with wind and wave, but about midnight Captain Venni and Signor Pellizoni became exhausted, let go, and were drowned. The Count di Montecupo, however, managed to keep hold of the ropes and struggled for six hours longer, slowly drifting towards Cape Misenum, where he was rescued by fishermen.

M. Rose's Airship.—Unlike the Zeppelin Airship, M. Rose's flying vessel is based on the principle of being heavier than air. The machine consists of two air-containers of forty-five metres in length, and at their widest eight metres diameter. The machinery and car are placed between the air-containers, which are connected by steel. The whole apparatus is constructed with aluminium tubes, and weighs only 800 kilos. When fully equipped its weight will be 2,200 kilos. Two horizontal screws are provided to raise and lower the airship, and two vertical screws to move it backwards or forwards. These four screws are worked by a petrol motor of 12-horse power. The air condensers are filled with gas to lighten the weight.

The Paris Balloon Contests.—The conditions of the seventh aerial contest held in connection with the Paris Exhibition were that the balloonists were to start from Vincennes and descend at Nanteuil, after previously alighting at Dammartin as a stopping station. Permission was granted the competitors to choose a day when the wind was blowing in the direction required. Only one competitor—M. Jacques Faure—accomplished the conditions of the contest. The rest were blown over Dammartin and Nanteuil without being able to effect a descent there.

M. Santos Dumont's Motor Balloon.—On September 19th M. Santos Dumont made an attempt to win the Grand Prize of the Paris Aero-Club in his motor balloon. The experiment took place in the presence of the members of the International Aeronautical Congress, but a mishap occurred to the stearing gear, which put an end to the project of sailing round the Eiffel Tower, though M. Santos Dumont appears to have caused considerable delight to the Aeronautical assembly by giving demonstrations of the motive powers of his balloon against the breeze, the balloon being held by guy ropes. The "Daily Express" thus describes M. Santos Dumont's apparatus: "The balloon proper is elongated, and looks much like a large torpedo. Three feet beneath this hangs the gasoline motor, which is to supply the motive power. The propeller is twelve feet in diameter, and is revolved so rapidly by the motor that the engine frequently gets red hot. The only accommodation for the traveller is a little bicycle seat, from which the aeronaut will direct his motor and stearing gear by means of treadles. Then the inclination or declination of his machine must be noted on the spirit levels at his side, and the two hundred odd pounds of ballast must be regulated as the course requires. It need hardly be pointed out after this description that the voyage which M. Dumont is about to undertake is uncommonly dangerous. There appears to be here all the elements of a catastrophe. A red-hot motor within a yard or so of some thousands of cubic feet of hydrogen is enough to give the most stout-hearted the 'creeps.' but M. Dumont makes light of it."

The Paris Exhibition Awards.—The international jury of the Paris Exhibition has awarded Mr. Eric Stuart Bruce an Honourable Mention Diploma for his exhibit of Electrical Balloon Signalling in Group XVIII. (Army and Navy).

Foreign Aeronautical Periodicals.

L'AERONAUTE (Paris).

June, 1900. Séances du 17, Mai et 7 Juin, 1900.—Scaphanche Aéronautique de M. Albut Andrien—Concours Internationaux

D'exercices Physiques et de Sports—July, 1900. Séances du 21 Juin et du 5 Juillet, 1900—Eloge de Dagron par M. de Fonvielle. Similitude Mécanique des Corps Plongès.

August, 1900. Séance du 19 Juillet, 1900. Sur les Eclipses par Dorothée Klumpké. Recit d'Ascension.

La France Aerienne (Paris).

15 au 31 Aout, 1900.—L'Aéronautique au jour le jour: Le Capitaine comte Zeppelin Dr. Ox. La Colombophilie au jour le jour: E. Caillé—Concours de ballons à Vincennes. V. Louet—Ascension à Douai: Louis Nopper—Aéronautique et Colombophilie à l'Annexe de Vincennes: La France Aerienne dans la Loire-Inférieure—Nécrologie: M. Adolphe—François Monfallet—Revue de Presse—A la volée—Académie d'aérostation météorologique de France.

1 au 15 Septembre, 1900.—Bulletin météorological Septembre—La Colombophilie au jour le jour. A propos de la dirigeabilité des Aérostats: Roberto Guérin—Les courses de ballons à L'aerodrome de Vincennes—Tableau d'honneur—Colombophilie et tirs aux pigeons—La France Aérienne en Vendée—La France Aerienne en Italie: Catastrophe aéronautique à Naples—La France aérienne en Amérique: Revue de Presse Etrangère—Résultats de concours colomphilie.

L'Aerophile (Paris).

May, 1900.—Portraits d'aéronautes contemporains: M. Victor Silberer (Wilfred de Fonville) L'emploi des cerfs-volants en Météorologie (Jules Vincent) La Catastrophe de Chalais—Meudon (Georges Géo)—Concours d'objectifs a long Foyer Pour la Téléphotographie en Ballon.

Zeitschrift fur Luftschiffahrt und Physik der Atmosphare.

June, 1900.—Captiv-Schraube von Wilh Kress. Apparat Zum Sichtharmachen der Fadenlinien vei Luftwiderstandserscheinungen, von G. Wellner. Die Flugarbeit, von K. Fuchs—Vereinsnachrichten Deutscher Verein zur Förderung der Luftschiffahrt in Berlin. Protokoll der Versammlung am 28 Mai, 1900—Vereinsfahrten am 28 April 5, 10, 12 und 14 Mai, 1900—Umschav Reglement des Grossen Preises des Aero-Club in Paris.

Illustrirte Aeronautische Mitheilingen. August, 1900. Bericht über den ersten Fahr-Versuch mit dem Luftschiff des Grafen von Zeppelin.

Notable Articles.

An unusually large number of excellent articles and notes have appeared in the daily press and periodicals during the last three months on aeronautical topics, and it is impossible to mention all of these in the following list. A selection therefore has been made.

July 4. *Daily Mail.*—"Mr. Hiram Maxim on Aerial Navigation."
5. *Daily Chronicle.*—"An Expert's Views on the Future of Flying."
6. *Morning Herald.*—"A New Air Ship."
7. *The Spectator.*—"The Zeppelin Air Ship."
9. *Morning Leader.*—"The Zeppelin Air Ship and its Inventor."
14. *La Nature.*—"The Zeppelin Air Ship."
Illustrated Mail.—"The Great German Air Ship."
18. *Daily Graphic.*—"Castles in the Air."
Morning Post.—"Balloons and Flying Machines."
19. *Times.*—"Aeronautical Experiments."
20. *Standard.*—"Count Zeppelin's Balloon."
21. *Standard.*—"The Scientific Use of Kites."
Illustrated London News.—"Count Zeppelin's Air Ship." (Illustrated.)
Penny Pictorial Magazine.—"How Balloons are Built." (Illustrated.)
28. *The Sphere.*—"Count Zeppelin's Wonderful Air Ship." (Illustrated.)
Madame.—"New Aerial Ships." (Illustrated.)

Aug. *The Strand Magazine.*—"The Zeppelin Air Ship." (Illustrated.)
3. *Standard.*—"A Balloon in a Thunderstorm." Letter to the Editor, by Rev. J. M. Bacon.
4. *The Sphere.*—"Balloons in War Time." (Illustrated.)
9. *Standard.*—"A Balloon in a Thunderstorm." Letter to the Editor, by S. H. Terry.
17. *Daily Graphic.*—"The Balloon Detachment for China. (Illustrated.)
18. *Golden Penny.*—"A Curious Flying Machine."
19. *Daily Express.*—"Balloons in Warfare."
31. *Daily Mail.*—"Mid-Air Signalling."
English Mechanic.—"A Balloon in a Thunderstorm." Letter to the Editor.

Sept. *Pearson's Magazine.*—"The Ship that Flies." (Illustrated.)
4. *Morning Post.*—"Cross Channel Ballooning."
6. *Times.*—"The Balloon Experiments."
7. *Daily Express.*—"Balloon Steering."
14. *News.*—"The Ship of Stars."
25. *La Nature.*—"Concours D'Aerostation."

Applications for Patents.

(From June 1st, 1900.)

The following List of Applications for Patents connected with Aeronautics has been specially compiled for the *Aeronautical Journal* by Messrs. BROMHEAD & Co., Patent Agents, 33, Cannon Street, London, E.C.:—

10,021 of 1900. JOHN JONES, 41, Reform Street, Dundee. **Improvements in and Relating to a New and Improved Flying Machine or Airship.**

11,475 of 1900. WILLIAM E. IRISH, 77, Calabria Road, Highbury. **Aeroplanes with Motor and Rudder.**

11,649 of 1900. JOHN JONES, 41, Reform Street, Dundee. **Improvements in Vehicles for Moving Overland or through the Air.**

12,514 of 1900. EMANUEL KALISCH, 19, Holborn Viaduct. **Improved Double-screw Propeller for Flying Machines.***

12,543 of 1900. WILLIAM RICHES, 2, Rose Hill Gardens, Jarvis Brook, near Tunbridge Wells. **Improvements in Aerial Navigation.**

12,844 of 1900. WILLIAM BRAKEFIELD, 3, Churchyard, Ashford, Kent. **Improvements in Flying Machines.**

12,941 of 1900. JOHN JONES, 41, Reform Street, Dundee. **Improvements in and Relating to Aerial Ships or Flying Machines.**

13,138 of 1900. GEORGES HUGHES, 55, Chancery Lane. **Improvements in Aerial Machines.** (Richard Mesch, Belgium).

13,220 of 1900. JOHN JONES and JOHN P. JONES, Sunbrae, Bingham Terrace, Dundee. **A New or Improved Propeller for Flying Machines, Aerial Ships, and Aerial Vehicles, and applied to these.**

13,241 of 1900. CHARLES GROOMBRIDGE and WILLIAM ALFRED SOUTH, 78, Fleet Street, London. **Improvements in Propellers for Use with Flying Machines, Balloons, and the like.**

15,376 of 1900. FELICE TURINA, Birkbeck Bank Chambers, Southampton Buildings, Chancery Lane, W.C. **Improved Means for Steering Balloons.***

Those marked * have been completed.

Those unmarked so are only provisionally protected.